

January 25, 1849.

Sir R. H. INGLIS, Bart., Vice-President, in the Chair.

The following papers were read :—1. Some remarks on a paper entitled "On the Depth of Rain which falls in the same localities at different Altitudes in the Hilly districts of Lancashire, Cheshire, &c., by S. C. Homersham, C.E." By John Fletcher Miller, Esq. Communicated by Lieut.-Col. Sabine, R.A., For. Sec. R.S.

The author, after alluding to the discordance between the conclusions at which he had arrived from a discussion of his meteorological observations in the lake district of Cumberland and Westmoreland, described in a former paper, and those drawn from the same facts by Mr. Homersham, in a paper read before the Society on the 25th of May last, states that the results for the year 1848 show a precisely similar gradation to those of the two preceding years; and that the whole of the observations appear to warrant the conclusion which he had ventured to draw from those detailed in his former paper.

He remarks that, as the rain-gauges are, with one exception, situated on the high mountains surrounding the head of the Vale of Wastdale, this valley is the only one which can fairly be selected as a standard in comparing the quantities of rain obtained at the different mountain stations. The discordance between his conclusions and those arrived at by Mr. Homersham, he considers, has arisen from that gentleman having selected the distant and excessively wet locality of Seathwaite at the head of the southern fork of Borrowdale, as a representative of the quantity of water deposited in the valleys generally.

If the receipts of the mountain gauges, he observes, be compared with the rain-fall at Wastdale Head, or in any of the other valleys except Seathwaite, it will be found that the quantity *increases* considerably up to 1900 feet, where it reaches a maximum; and that above this elevation it rapidly decreases, until at 2800 feet above the sea the amount is very much *less* than in the surrounding valleys.

In conclusion, the author states that it appears to him, that much of the discordance in the results obtained at various elevations amongst the mountains has arisen from the circumstance of the instruments having been placed on the slope or breast of the hill nearly in a line with each other; in which positions, he is convinced from experience, that when strong winds prevail, the gauges are exposed to eddies or counter-currents, which prevent a portion of the water from entering the funnel, and thus a less depth of rain is obtained than is due to the elevation.

The gauges under his superintendence being all stationed either on the top or shoulder of the mountain, and exposed to the wind from every point of the compass, are not, he observes, open to this objection.

2. Supplement to a paper "On the Theory of certain Bands seen

in the Spectrum." By G. G. Stokes, Esq., M.A., Fellow of Pembroke College, Cambridge. Communicated by the Rev. Baden Powell, M.A., F.R.S.

The principal object of the author in this communication is to point out some practical applications of the interference bands recently discovered by Professor Powell, the theory of which was considered by the author in the paper to which the present is a supplement. The bands seem specially adapted to the determination of the dispersion in media which cannot be procured in sufficient purity to exhibit the fixed lines of the spectrum. The ordinary experiments of interference allow of the determination of refractive indices with great precision; but in attempting to determine in this way the dispersion of the retarding plate employed, there is the want of a definite object to observe in connection with the different parts of the spectrum. In Professor Powell's experiment, the wire of the telescope, placed in coincidence with one of the fixed lines of the spectrum previously to the insertion of the retarding plate into the fluid, marks the place of the fixed line, and so affords a definite object to observe when the retarding plate is inserted into the fluid, and the spectrum is consequently traversed by bands of interference.

The practical applications considered by the author are principally four. In the first, the variation of the refractive index of the plate in passing from one fixed line to another is determined, the absolute refractive index for some one fixed line being supposed accurately known. The observation consists in counting the number of bands seen between two fixed lines of the spectrum, the fractions of a band-interval at the two extremities being measured or estimated.

In the second application, the absolute refractive index of the plate is determined for some one fixed line of the spectrum. The observation consists in counting the number of bands which move across the wire of the telescope, previously placed in coincidence with the fixed line in question, when the plate is inclined to the incident light.

The third application is to the determination of the change in the refractive index of the fluid, for any fixed line of the spectrum, produced by a change in the temperature. The observation consists in counting the number of bands which move across the wire of the telescope while the temperature sinks from one observed value to another, the temperature being noted by means of a delicate thermometer which remains in the fluid. For this observation a knowledge of the refractive index of the retarding plate is not required.

The fourth application is to the determination of the change of velocity of the light corresponding to any fixed line of the spectrum, when the direction of the refracted wave changes with reference to certain fixed lines in the plate, which is here supposed to belong to a doubly refracting crystal. The observation consists in counting the bands as they pass the wire when the plate is inclined. It requires that the plate should be mounted on a graduated instrument. It would be possible in this way to determine, by observation alone, the wave surface belonging to each fixed line of the spectrum.

While considering the theory of Professor Powell's bands, the author was led to perceive the explanation of certain bands, described by Professor Powell, which are seen in the secondary spectrum formed by two prisms which produce a partial achromatism. Although the account of these bands has been published many years, they do not seem hitherto to have attracted attention. It is easily shown by common optics that when two colours are united by means of two prisms, the deviation, regarded as a function of the refractive index, the angle of incidence being given, is a maximum or minimum for some intermediate colour. For the latter colour, two portions of light of consecutive degrees of refrangibility come out parallel; and therefore the diffraction bands belonging to different kinds of light, of very nearly the same refrangibility with the one in question, are superposed in such a manner that the dark and bright bands respectively coincide. Thus distinct bands are visible in the secondary spectrum, although none would be seen in the spectrum formed by a single prism, in consequence of the mixture of the bright and dark bands belonging to different kinds of light of nearly the same degree of refrangibility. The diffraction bands here spoken of are of very sensible breadth, in consequence of the small width of the aperture employed in the actual experiment.

When a spectrum is viewed through a narrow slit half covered by a plate of mica, the edge of which bisects the slit longitudinally, and is held parallel to the fixed lines of the spectrum, the bands described by Sir David Brewster are seen, provided the mica plate lie at the side at which the blue end of the spectrum is seen, and provided the thickness of the plate and the breadth of the slit lie within certain limits. When these bands are invisible in consequence of the slit being too narrow, or the spectrum too broad, it follows from theory that the bands ought to appear when the slit and plate are turned round the axis of the eye, so that the edge of the plate is no longer parallel to the fixed lines of the spectrum. The author has verified this conclusion by experiment, employing plates adapted to observations with the naked eye, which are best suited to the purpose.

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February 1, 1849.

GEORGE RENNIE, Esq., Treasurer, Vice-President, in the Chair.

The following paper was read:—"On the Chemistry of the Urine;" in three Parts. By H. Bence Jones, M.D., M.A., F.R.S.

Part I. *On the variations of the Acidity of the Urine in Health.*

The mode of examination adopted by the author was the following: Two test solutions were made; the one with carbonate of soda; the other with dilute sulphuric acid, of such strength that each measure of a graduated tube, when filled with either solution, was equivalent to one-twelfth of a grain of dry and pure carbonate of soda.

A weighed quantity of urine was neutralized by one or other of